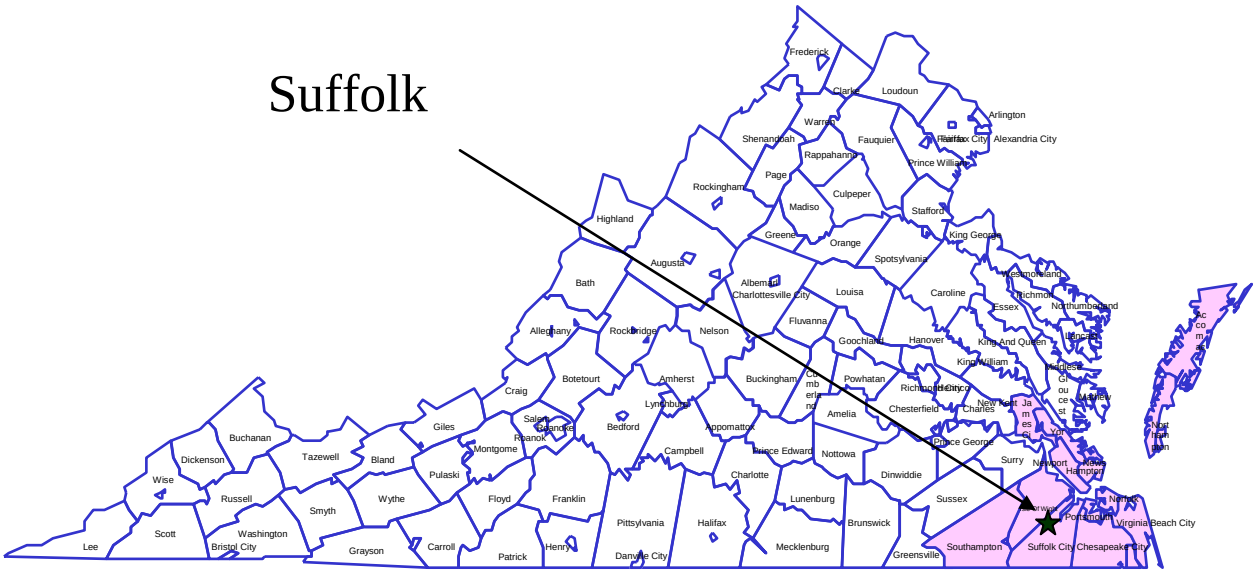
Ambient Air Monitoring Work plan
for
Suffolk County Monitoring Project

VADEQ
Office of Air Quality Monitoring



1. Introduction

In September 2009 the Virginia State Air Pollution Control Board ("Board") became aware of complaints against two major fumigation facilities in Suffolk County. The two major fumigation facilities are Western Fumigation located at 4165 Pruden Blvd, Suffolk, VA and Royal Fumigation located at 520 Finney Ave, Suffolk, VA. The complaints stated that these facilities had been operating as major sources of hazardous air pollutants (HAP) without a VADEQ permit. The Board directed VADEQ staff to provide a report to the Board on what, if any, enforcement or permitting action was necessary for these fumigation facilities as well as measures that could be undertaken to ensure that sources requiring a permit should be permitted.

The Office of Air Quality Monitoring (AQM) was asked to perform a study of the ambient air surrounding the fumigation facilities to determine if the methyl bromide concentrations approached or exceeded the 1-hour standard for Virginia's Significant Ambient Air Concentration (SAAC) which is 950 $\mu g/m^3$. The SAAC is the level which if exceeded may have an adverse impact on human health. The Virginia Department of Health (VDH) was asked to evaluate whether methyl bromide levels posed a public health risk in Suffolk.

2. Background

Methyl bromide is a colorless highly volatile gas with a chemical formula CH_3Br with a molecular weight of 94.95 g/mol. It is slightly soluble in water. It is practically odorless except at high concentrations with an odor threshold of 80 mg/m^3 above which it becomes detectable with a sweetish chloroform like odor. Methyl Bromide is primarily used as a fumigant and pesticide. It is widely used in agriculture as a soil fumigant to control fungi, nematodes and weeds. In industry it is primarily used as a commodity fumigant for food products such as grains and wood logs to control rodents and insects. The background concentrations of methyl bromide are roughly <0.025 ppb. Some natural sources of CH_3Br are algae and ocean kelp, and trace levels have been detected in drinking water. Ambient levels can be higher near farms and industrial facilities which use CH_3Br, and this is a source of concern. Acute exposure to CH_3Br in case industrial workers has been known to cause respiratory problems.

3. The 2010 AQM Study and Site Description

The AQM conducted an air monitoring investigation for ambient methyl bromide concentrations in 2010 at both Western and Royal Sites. At both Royal and Western air monitoring was conducted for background samples as well as samples collected during active aeration, and methyl bromide was detected in both background samples and active aeration samples. Background samples were collected on dates when no fumigation or aeration was being actively conducted at the facility and both 1-hour average and grab samples were collected. The aeration samples were collected at the fence line of the property when the building was being actively vented, i.e. blowers were being operated and were aerating the buildings.

At the Western Fumigation Site sampling was conducted during August-November 2010 over 6 non-consecutive dates. The Western Fumigation facility is located in a relatively accessible and

open area along Pruden Blvd (Route 460) in Suffolk. The processing area is bounded by an open field along the eastern edge of the property, an industrial facility to the North, a technical center (Pruden Technical Center) and school yard to the Northwest, a parking lot to the West, and new construction is 200 yards to the South. A farmhouse is 160 yards to the east. The nearby residential area is approximately 700 yards away from the eastern edge of the property. Attached below (Figure 1) is a satellite view of the facility with important surrounding features identified.

Sixteen background samples, including grab and 1-hour samples, were collected over two dates and two grab samples had measureable amount of methyl bromide in the range of 28-38 µg/m^3. Thirty-two aeration samples were collected on four dates of which 21 were grab samples and 11 were 1-hour samples. In case of grab samples methyl bromide concentrations ranged from non-detect to 2078 µg/m^3. In case of 1-hour samples the highest concentration was 516 µg/m^3 with methyl bromide being detectable only in the samples collected downwind of the Site. The study at Western Fumigation is discussed in detail in a report prepared by VDH (2).

Figure 1. Western Fumigation Site

At the Royal Site sampling was conducted during January-April 2010 over five non-consecutive dates, and 24 background samples and 35 aeration samples were collected. The Royal Fumigation facility is located in a relatively accessible and open area along Finney Road in

Suffolk. The processing area is bounded by homes along the eastern edge of the property contiguous to railroad tracks that run directly South of the property line. Homes are also located directly south of the processing area. The processing area is also bounded by business (Addison Foods) to the east and a generally open area to the North. Attached below (Figure 2) is a satellite view of the facility with important surrounding features identified.

Methyl bromide was detected in 8 out of 24 background samples and ranged from 0.4-2.8µg/m^3. Thirty five aeration samples were collected of which 30 were grab samples, and 5 were 1-hour samples. In case of grab samples 19 had measurable methyl bromide concentrations, and the highest concentration was 959µg/m^3 which is above the 1-hour SAAC. In case of 1-hour samples there were measurable amounts in all five samples, with the highest concentration being 846µg/m^3. A report prepared by VDH has discussed this study at Royal in detail (1). The 2010 studies were inconclusive regarding the health risk posed by methyl bromide and further investigations were recommended by VDH.

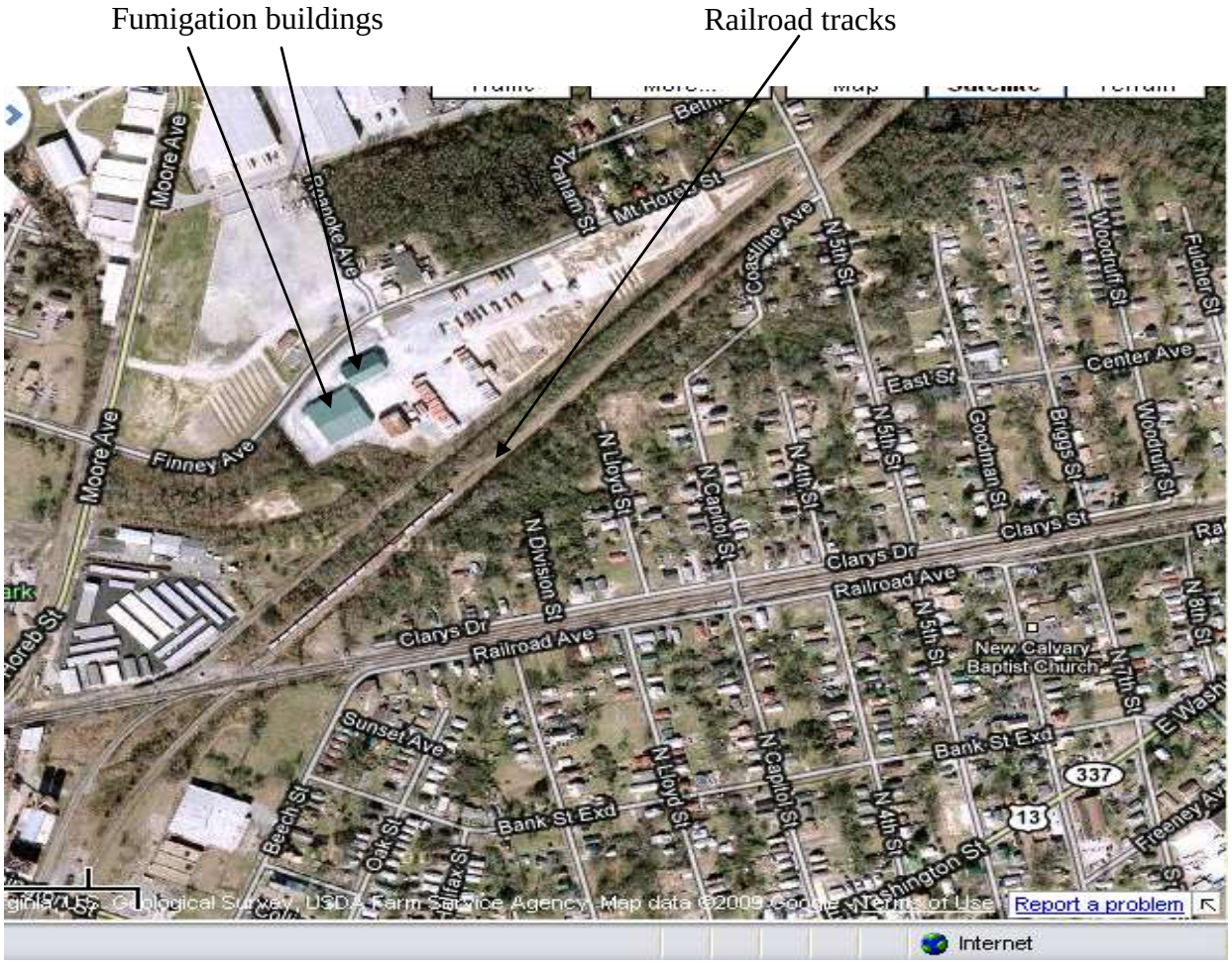


Figure 2. Royal Fumigation Site

4. Study Objective

The objective of this study is to characterize the background methyl bromide concentrations in Suffolk County under various meteorological conditions. It is a follow up to the 2010 study and the purpose is to collect additional ambient air samples in the areas surrounding Royal Fumigation and Western Fumigation when the facilities are not fumigating or venting actively. The Project Plan addresses the following tasks:

- Determine a background concentration in the immediate vicinity of the source by taking canister grab samples outside the fence line/perimeter of the facilities. This sampling regimen should be performed when aeration is not taking place. Due to fumigation schedules it may not be possible to perform all sampling events when no fumigation is going on. The background sampling will include information as to whether fumigation is occurring at the time of the sampling. Ideally the process buildings will have had the opportunity to vent for at least 24 hours. In case of Royal which has two fumigation buildings, it may not be possible to sample at a time when both building are not actively fumigating.
- Establish an on-site monitoring trailer with meteorological instrumentation and storage capability for sampling canisters.
- Perform canister grab sampling, collect 1-hour samples, and collect 8-hour samples under varying meteorological conditions.
- The samples should be collect in both upwind and downwind directions.

5. Sampling Method

The sampling done during this study will be canister sampling using Silco/Summa canisters, supplemented with a Photo-ionization Detector (PID) network. Grab samples, 1-hour and 8-hour samples will be taken in the upwind and downwind directions of the facility. There will be a fixed meteorological site established for this study. In case of both Royal and Western the following procedure will be generally followed. The facility will be contacted to find out dates when the facility is not actively fumigating and aerating. If fumigation was recently done and the buildings were aerated, then active aeration should have been completed at least 24 hours prior to DEQ collecting background samples. DEQ will plan to go to the facility with the samplers and equipment to set up for collecting background samples. Table 1 lists the air monitoring and sampling equipment that could be used for the study.

Table 1. Equipment to be used to achieve monitoring objective

Monitor Method	**Designation**	**Analysis Method**	**Frequency of Sampling**
Xontech 910C Sampler	Active Canister Sampler	TO-15; Sample will be analyzed via GC/MS at DCLS	Based on site meteorological conditions.
Xontech 912 Multi-Adapter	Multiple Canister Adapter	TO-15; Sample will be analyzed via GC/MS at DCLS	Based on site meteorological conditions.

Veriflo Passive Flow Controller	Passive Canister Flow Controller	TO-15; Sample will be analyzed via GC/MS at DCLS	Based on site meteorological conditions.
ATEC PV2 Sampler	Passive Canister Sampler	TO-15; Sample will be analyzed via GC/MS at DCLS	Based on site meteorological conditions.
Silco/summa Canister, rated 40 psig, under vacuum	One time sampling technique	TO-15; Sample will be analyzed via GC/MS at DCLS	Based on site meteorological conditions.
NovaLynx Portable Weather Station 110-WS-18	Temperature, barometric pressure, wind speed and direction	Data will be manually downloaded	The NovaLynx station collects data continuously in 5 minute increments.
ppbRAE 3000 Photo-ionization detectors (PID)	Real-time measurements volatile organic compounds	Data can be downloaded to a PC	Based on Site meteorological conditions.

The Silco canister shown is representative of canisters that will be used for this study. Note that each canister has a serial number.

Figure 3. Silco Canister used for collecting grab air samples.

Silco canister with Veriflo flow controller. This is the primary model that will be used for this study. Note that each canister has a serial number.

Figure 4. Silco canister with flow controller used for collecting 8-hour air samples.

Figure 3 shows the Silco canisters that will be used for collecting grab samples. Figure 4 shows the Silco canisters with flow controller that will be used to collect air samples for 8-hour sampling. The canisters are cleaned and certified by the Division of Consolidated Laboratory Services (DCLS) and under at least 28 in.Hg vacuum. The Veriflo flow controllers will be cleaned prior to being used for sample collection. DEQ also has a portable photo-ionization detector (PID) system with a detection capability of approximately 1 ppb-10,000 ppm. DEQ has eight portable ppbRAE 3000 PID units which will be used around the perimeter of the facility to detect any "hot-spots" of methyl bromide. The canister samples will be sent to DCLS for GC/MS analysis using EPA method TO-15 (3). The office of AQM will work with DCLS to investigate the possibility of doing GC/MS-SIM mode analysis for the air samples specifically to detect low levels of methyl bromide.

DEQ has a 12-foot Haulmark sampling trailer (Figure 5) equipped with a NovaLynx portable weather station capable of collecting and storing meteorological data such as wind direction, wind speed, temperature and barometric pressure. Optimally, the trailer will need a 220v power supply to operate the environmental controls for the NovaLynx data collection computer. However, if power is not available it should be sufficient to use battery backup in conjunction with a power inverter. In case of both facilities the sampling trailer will be stationed outside of the fence line/perimeter of the property in a location which is determined most suitable for purposes of collecting air samples and meteorological data.

Figure 5. DEQ's Haulmark Sampling trailer

6. Sampling at Western Fumigation

Figure 6 shows an aerial view of the Western Fumigation facility with the surrounding landmarks. Background sampling will be conducted in the downwind and upwind directions near the Western fumigation facility. The sampling dates will be selected based on communications with Western and weather conditions. The location marked with a red arrow is a possible spot for the Haulmark sampling trailer, which is the northwest corner of the south parking lot.

DEQ plans to collect two 8-hour samples in the areas upwind and downwind of the fumigation facility approximately 300 feet from fence line of the property. The prevailing wind direction will dictate where the samples will be collected. There is a children's daycare center northwest of the parking lot shown in Figure 6 which is approximately 500-700 feet from the Fumigation building, and is one possible 8-hour sample collection spot. There are apartments approximately 500 feet South of the fumigation facility (marked with a red circle) and an 8-hour sample can be collected in that location also. The portable PID network monitors will be moved around the perimeter of the property, and additional grab samples maybe collected in any "hotspots", i.e. areas with high VOC readings. Figure 8 shows a sample data collection sheet to be completed for each canister sample.

Figure 6. Potential sampling locations at Western Fumigation.

7. Sampling at Royal Fumigation

Figure 7 shows an aerial view of Royal Fumigation with the surrounding landmarks. The sampling dates will be selected based on communications with Royal and weather conditions. Background sampling at Royal will be conducted in the downwind and upwind directions at approximate 300-500 feet distance from the fence line of the Royal Fumigation property marked in Figure 7. Prevailing wind direction will dictate determination of the upwind and downwind directions. DEQ plans to collect two 8-hour background samples. One possible sample collection location could be down Mt. Horeb Road which is marked with a red circle on Figure 7. An additional 8-hour sample could be collected in the area Southeast of the railroad tracks. The portable PID network monitors will be moved around the perimeter of the property, and additional grab samples maybe collected in any "hotspots", i.e. areas with high VOC readings. Figure 8 shows a sample data collection sheet to be completed for each canister sample.

Figure 7. Potential sampling locations near Royal Fumigation.

8. Meteorological Station Siting Criteria

The meteorological instrumentation associated with this study will be installed using guidance provided in the EPA Quality Assurance Handbook for Air Pollution Measurement Systems – Volume IV: Meteorological Measurements Version 2.0 (4). The siting criteria used will be the recommendations for the 30 foot tower installations. The following write-up is taken from the general guidance in the Handbook regarding tower and instrument placement.

As a general rule, meteorological sensors should be sited at a distance beyond the influence of obstructions, such as buildings and trees; this distance depends on both the variable to be measured and the type of obstruction. The other general rule is that measurements should be representative of meteorological conditions in the area of interest. Secondary considerations, such as accessibility and security, must be taken into account, but should not compromise the quality of the data. In addition to routine quality assurance activities, annual site inspections should be made to verify the siting and exposure of the sensors

Site selection for tower placement should address the question, "Is the site (are the data) representative?" Representativeness is defined as "the extent to which a set of measurements taken in a space-time domain reflects the actual conditions in the same or different space-time

domain taken on a scale appropriate for a specific application". In general, the location of the tower should be representative of meteorological conditions in the "area of interest"

Proper siting is part of a total quality assurance program. Ideal siting may not always be attainable. In fact, in many urban areas where air quality studies are traditionally made, it will be impossible to find a site that meets air quality and meteorological siting criteria. It is incumbent upon an agency gathering data to carefully describe the meteorological siting deficiencies in a site and, if possible, quantify or at least evaluate the probable consequences of the siting deficiencies on the data.

1. Wind Instrument Siting

Optimum measurement height may vary according to data needs. Open terrain is defined as an area where the horizontal distance between the instrument and any obstruction is at least 10 times the height of that obstruction. An obstruction may be man-made (e.g., a building) or natural (a tree). A wind instrument should be securely mounted on a mast that will not twist, rotate, or sway. If a wind instrument must be mounted on the roof of a building, it should be mounted high enough to be out of the wake of an obstruction. Roof mounting is not a good practice and should only be resorted to when absolutely necessary. Sensor height and its height above the obstructions, as well as the character of nearby obstructions, should be documented.

2. Temperature Sensor

Temperature sensors should be mounted over a plot of open level ground at least 9 m in diameter. The ground surface should be covered with non-irrigated or un-watered short grass or, in areas where grass does not grow, natural earth. Gravel surfaces are also acceptable. The surface must not be concrete or asphalt or oil-soaked. The standard height for climatological purposes is 1.25 m to 2 m, but different heights may frequently be required in air quality studies. For general purposes, the primary temperature sensor is mounted 2 m above ground level, with the inlet facing away, and at a distance of approximately 1.5 times the tower diameter, from the tower.

The sensors should not be close to obstructions, such as trees and buildings, than a distance equal to 4 times their height. They should be at least 30 m from large paved areas and not close to steep slopes, ridges, or hollows. Areas of standing water should also be avoided. Louvered instrument shelters should be oriented so that the door opens toward true north in the northern hemisphere. Motor-aspirated shields should also be oriented with the sensors toward true north in the northern hemisphere.

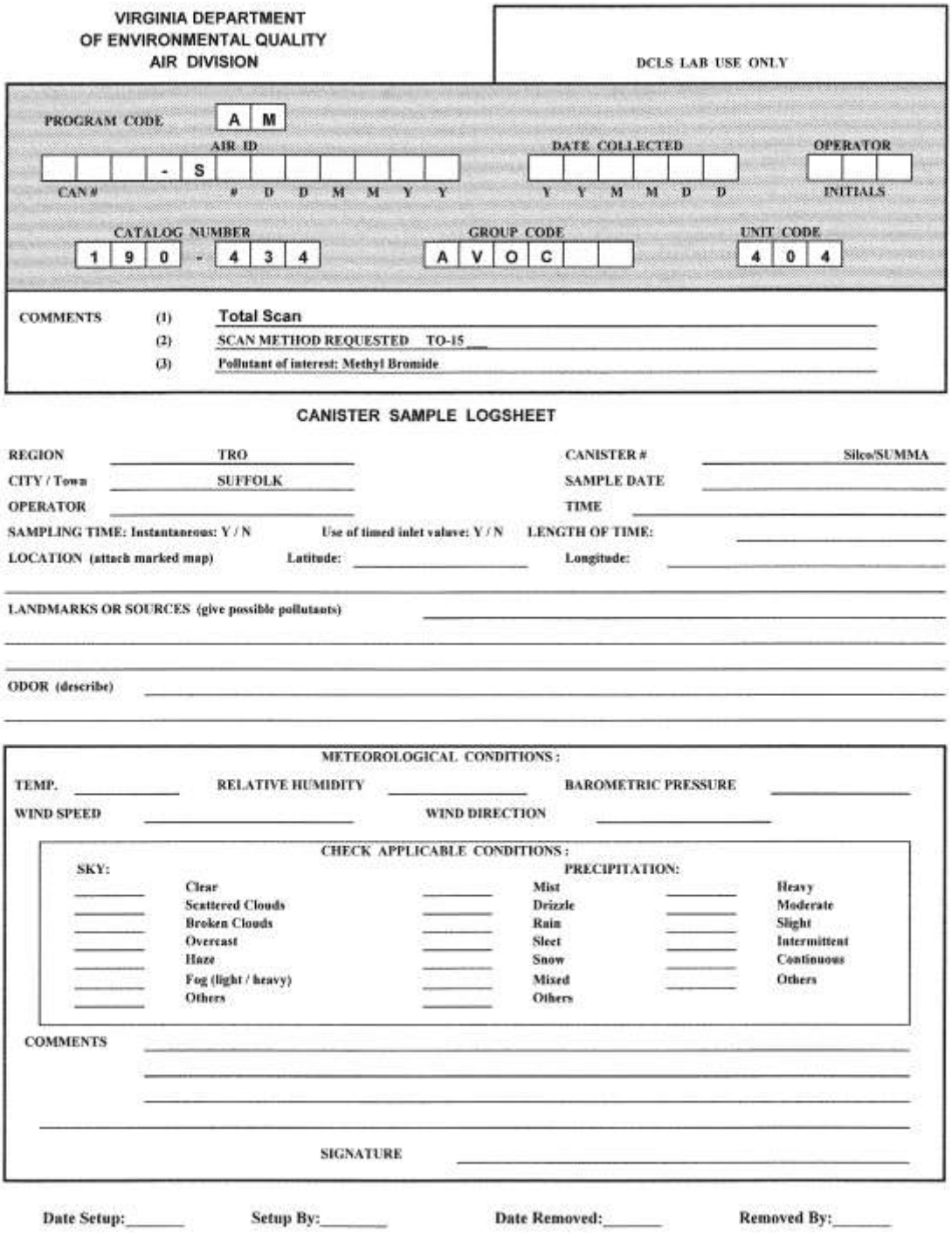
3. Barometric Pressure

The location of a barometer should be carefully considered in order for the equipment to accurately measure atmospheric pressure. A barometer should be placed in a location

- ► That has uniform, constant temperature
- ► That has good general lighting but is shielded from direct sunshine
- ► That is away from drafts and heaters

- ► Where it will have a solid, vertical mounting
- ► Where it will be protected against rough handling

Wind can cause dynamic changes in air pressure, therefore causing barometric readings to be inaccurate. Fluctuations from wind are superimposed on the static pressure and, with strong and gusty wind, may amount to 2 or 3 hPa. It is usually impractical to correct for such fluctuations because the "pumping" effect on the mercury surface is dependent on both the direction and force of the wind, as well as on the barometer's location. Thus the "mean value" will not represent the true static pressure.



VIRGINIA DEPARTMENT
OF ENVIRONMENTAL QUALITY
AIR DIVISION

DCLS LAB USE ONLY

PROGRAM CODE: A M

AIR ID: _ _ _ - S _ _ _ _ _ _ _ (CAN # # D D M M Y Y)

DATE COLLECTED: _ _ _ _ _ _ (Y Y M M D D)

OPERATOR: _ _ _ (INITIALS)

CATALOG NUMBER: 1 9 0 - 4 3 4

GROUP CODE: A V O C _ _

UNIT CODE: 4 0 4

COMMENTS
(1) Total Scan
(2) SCAN METHOD REQUESTED TO-15
(3) Pollutant of interest: Methyl Bromide

CANISTER SAMPLE LOGSHEET

REGION: TRO
CANISTER #: Silco/SUMMA
CITY / Town: SUFFOLK
SAMPLE DATE:
OPERATOR:
TIME:
SAMPLING TIME: Instantaneous: Y / N Use of timed inlet valave: Y / N LENGTH OF TIME:
LOCATION (attach marked map) Latitude: Longitude:
LANDMARKS OR SOURCES (give possible pollutants)
ODOR (describe)

METEOROLOGICAL CONDITIONS:

TEMP. RELATIVE HUMIDITY BAROMETRIC PRESSURE
WIND SPEED WIND DIRECTION

CHECK APPLICABLE CONDITIONS:

SKY:		PRECIPITATION:			
	Clear		Mist		Heavy
	Scattered Clouds		Drizzle		Moderate
	Broken Clouds		Rain		Slight
	Overcast		Sleet		Intermittent
	Haze		Snow		Continuous
	Fog (light / heavy)		Mixed		Others
	Others		Others		

COMMENTS

SIGNATURE

Date Setup: Setup By: Date Removed: Removed By:

Figure 8. Canister Sampling Field data sheet

9. References

1. http://www.vdh.state.va.us/epidemiology/DEE/PublicHealthToxicology/documents/pdf/Royal%20Fumigation%20LHC%2009%2024%202012.pdf

2. http://www.atsdr.cdc.gov/HAC/pha/WesternFumigation/WesternFumigationLHCVA07312012.pdf

3. http://www.epa.gov/ttnamti1/files/ambient/airtox/to-15r.pdf

4. http://www.epa.gov/ttnamti1/met.html